



NEWSLETTER

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General Notes	1
Center Activities	
I. Testing and Evaluation	
A. Comparative Systems Laboratory	4
B. Search Strategy	7
C. Relevance Assessment Study	8
II. "Systems Approaches"	
A. Educational Research	9
B. Automatic Processing	11
C. Autopsy Diagnoses	12
D. Diabetes Literature	12
E. Library Mechanization Study	13
III. Educational Programs	14
Courses: Academic Year 1965-66	15
References	16

CENTER FOR DOCUMENTATION AND COMMUNICATION RESEARCH

SCHOOL OF LIBRARY SCIENCE

WESTERN RESERVE UNIVERSITY

CLEVELAND, OHIO 44106

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GENERAL NOTES

The anniversary of the founding of the Center for Documentation and Communication Research (CDCR) in 1955 by Dean Jesse H. Shera was not formally celebrated at Western Reserve, even though the "holes" from cards and paper tape processed over that 10-year period would have provided more than enough confetti. A deeper satisfaction came from two other facts.

First, the level of research activity at the Center hit an all-time high in 1964-1965, measured both by the number of projects and by the necessary outside financial support, gratefully received from a number of agencies. Most recently, the Center has announced the completion of a contract with the National Science Foundation to investigate the variability of human relevance assessments in relation to document searching. Director of the project is Asst. Professor Alan M. Rees; his co-principal investigator is Dr. Douglas G. Schultz of Western Reserve's Department of Psychology. The \$94,588.00 contract is for a two-year period.

Second, the addition of a disc-storage unit to the GE-225 complex made it possible for the Center's Computer Laboratory to make available its services and cooperation to an ever-increasing number of users both in the University and in the community at large. Examples of the latter include the American Cancer Society, the Cystic Fibrosis Foundation, etc. A full second-shift operation was inaugurated by Asst. Professor Robert Lyle Jacobs, Manager of the Computer Laboratory. He organized the first of a series of two-week Fortran courses, intended to familiarize faculty and staff with computer capabilities. The courses were taught by Irene Reineks, head of the programming staff, and Michael Smith.

Among the numerous publications deriving from the Center's educational and research programs, two are worthy of separate note here:

The Education of Science Information Personnel -- 1964. Proceedings of an Invitational Conference.
A. J. Goldwyn and Alan M. Rees, eds. (Available by request to the Center at \$4.00 per copy.*)

A Selected Bibliography: Autumn, 1965. (Available by request to the Center without charge.)

A few comments under the general heading of "Personnel" may be of interest, although space must restrict these to those who have travelled the longest distance to join the staff:

George Ember, formerly of the Institut de Medicine et Chirurgie experimentales, Universite de Montreal, joins the Center's staff as Lecturer and Research Assistant. He is co-author (with Hans Selye) of the most recent edition of Symbolic Shorthand System for Physiology and Medicine.

Dr. Madugula I. Sastri, who worked at the Center during 1961-1962 while completing work on his doctorate, has returned as a full-time Research Assistant (Structural Linguist). During the intervening period he taught at Andhras University, in India.

F. W. Harwood of the University of Tasmania is another welcome exotic returnee, in this case to temporary duty as a consultant to the NSF "automatic classification" project.

Travel highlights during the past year included Jessica Melton's week-long institute in "New Methods of Information Retrieval," presented at the Institute of Engineering, University of Mexico, and A. J. Goldwyn's participation as lecturer in a two-week NATO Advanced Study Seminar in The Hague, the Netherlands. Record mileage was achieved by Alan Rees, in the course of numerous trips throughout the East and Middle West as panelist, speaker

*The publication of this book was made possible through the generosity of the Lubrizol Foundation and its Secretary, Mr. Harry L. Jackson. Income derived from its sale will help to defray the costs of the Conference itself.

or consultant. And by the summer of 1965, Dean Shera returned to travel status, recovered from a series of physical misadventures.

Since there are 35 full-time staff members (before the manning of the new NSF project), space at 10831 Magnolia Drive continues to be a problem. Extensive remodelling of the carriage house has provided office space for the programmers that is conveniently close to the computer. But the "main house" is still straining at the seams, and expected further expansion of the education and research programs threatens even more serious crowding.

A. J. Goldwyn
Executive Director

CENTER ACTIVITIES

I. Testing and Evaluation

- A. Development of a Documentation Facility for the Health Sciences, National Institutes of Health Grant No. FR-00118-02. Principal Investigator: A. J. Goldwyn.

(References 7, 13, 14, 18, 20, 21, 23, 26, 28)

Largest in scope and central to much of the CDCR's program because it focuses within itself so many of our research concerns is the Comparative Systems Laboratory (CSL), supported now for the third year by the Division of Research Facilities and Resources, National Institutes of Health.

The second year of PHS Grant FR-00118 has continued the work of the Comparative Systems Laboratory (CSL) at the Center for Documentation and Communication Research (CDCR, as described in the Progress Report for FR-00118-01. The principal tasks remain:

1. to determine at what point, and under what conditions, the performance of an information retrieval system is optimized; and
2. to establish the comparative performance of a number of system components, and then of a number of systems, under controlled conditions.

Major activities have continued to be the formulation of methodology, the preparation of files for testing, and the establishment of user groups. As this implementation has moved into the second year, major emphasis has been on the documentation of effort (16 Internal Reports have been prepared, some of which will serve as material for general publications); on the preparation of supporting computer programs (28 programs have been prepared

specifically for this project); and on the working out of the physical modes of dealing with the user group (apparently trivial but actually complex, both mechanically and psychologically).

As indicated in the report for FR-00118-01, a good deal of time and effort have gone into the development of question analysis as it relates to search strategy, and of search strategy itself. These efforts were aided during part of the grant year by the full-time services of Dr. I. M. Whitwam, who has since returned to medical practice in England, as well as by the permanent staff. Aiding also in the development of methodology was a "pre-pilot" user, Dr. Kenneth S. Warren, Asst. Professor of Medicine, WRU, a researcher in schistosomiasis, who formulated questions to the file and evaluated the automatic output provided to him by the system(s). This contact was developed at the same time that arrangements with the main pilot group (arranged through the Communicable Disease Center [CDC]) yielded 20 users who submitted a total of 135 questions. Each of these is being searched, using each of the separately-processed subfiles. (Indexing languages, as indicated earlier, include telegraphic abstracts, key words [derived both manually and by the computer], meta-language based on titles, and the conventional index entries produced routinely for manual use by the editors of the Tropical Disease Bulletin. Coding of terminology approached completion with some 7,000 revised encoded entries. Every index term on tape can be searched either as an independent English term or as an encoded representation thereof, with associated thesaural values.)

A somewhat separate effort was directed toward the evaluation of indexer qualifications, and variations in efficiency associated therewith. Psychological, educational, and professional profiles of a group of 13 indexers were compiled, and are being correlated with results of a comparison of their work with that done by regular full-time professionals.

The effects of incentives (pay variations, etc.) are also being accumulated.

Actual interrogation of the file began in April, 1965, and is continuing through the series of more than 1,000 separate requests derived from exhaustive analysis of the 135 questions received so far. The guidelines developed through the first two years' study will now be "operationally" tested, and the hoped-for rigidity of the CSL techniques put under fire. Measurements developed under FR-00118-01 will be applied, and it is hoped that the third year will see the publication of preliminary results. Also planned are meticulous statistical appraisal of the data, reappraisal of methodology, and preparation of full-text files as the basis for further advanced study. Finally, we would hope during the next year to begin to develop an approach to the full-scale testing of an already operating information-retrieval system for the medical literature or some part thereof.

Among the contacts with present or potential users established by the CSL, in addition to the CDC and the (London) School of Hygiene and Tropical Medicine, was the Arthropod-Borne Virus Information Exchange. Public presentations of material related to or based on the CSL and explicitly credited thereto have been made at the American Documentation Institute annual meeting (October, 1964), the National Science Foundation "Study Conference on Evaluation of Document Searching Systems and Procedures" (October, 1964), the NATO Advanced Study Institute on the Evaluation of Information Retrieval Systems (July, 1965), and the Drexel Conference on Technical Information Center Administration (June, 1965), among others.

Tefko Saracevic, Instructor in Library Science, is Manager of the project, aided by Mrs. Marilyn Bobka.

- B. Search Strategy. Air Force Office of Scientific Research. Grant No. AF-AFOSR-403-65. Principal Investigator: William Goffman.

(References 5, 6, 7, 8, 9, 10)

Reversing the more orthodox process of putting theory into practice, information science has too often been characterized by a somewhat aimless search for theory to back up or justify already-established practice. At the CDCR, the investigation of the theoretical aspects of information retrieval has been a cornerstone of the research program for a number of years. The AFOSR project, under the active direction of Dr. William Goffman, has made an ever-stronger contribution to both educational and research activities, particularly in the area of experimental design and evaluation techniques.

Able assistance up to the Spring of 1965 was given by Dr. Vaun A. Newill, who left at that time for a tour of PHS duty in Japan. Dr. A. D. Booth, whose appointment to the faculty was announced last year, is now active in the advising of doctoral candidates and in research design, as well as in the teaching of information retrieval theory.

AFOSR activities have included:

1. A mathematical model has been developed, in which epidemic theory is applied to the information spread within a population. This model is an extension of the mathematical model of an information retrieval process which was constructed during the previous year.

A communication process can be looked at as an epidemic process in which there is embedded an information retrieval process which functions as an instrument for providing effective contact between the susceptibles (users) and infectives (file).

With this approach, it becomes possible to consider a communication process in terms of an optimal control problem. For example, it is possible to determine the precise point in time at which it is necessary to introduce an information retrieval system into a given population of research workers.

2. A series of experiments was designed for the purpose of testing the theory. The first experiment consisted of a comparative study of the effectiveness of an expert, a machine and chance in searching titles in a sub-area of the field of diabetes. This study is the first phase of a set of experiments to determine whether an automatic device can perform a complex task such as searching literature by means of a sequence of simple tasks each one of which it can accomplish as well as a human. The nature of these tasks would be determined by applying a theory in which the physical process has been reduced to its elements and in which the fundamental relationships between these elements and their essential properties have been established.
3. The continued development and application of a methodology for comparative studies of information retrieval systems.

C. Empirical Study of Relevance Assessments to Document Searching. National Science Foundation. Contract No. NSF-C-423. Principal Investigator: Alan M. Rees.

This new project is described on the first page (General Notes) of this Newsletter.

II. "Systems Approaches"

When this heading first appeared in last year's Newsletter, it had some value if not of novelty at least of freshness. During the past year, the "systems approach" has become a vogue expression -- like so many others, in the brief history of documentation. The CDCR continues to believe that the system is the sum of its parts, and to consider the system for each specific application as a complex of peculiarly appropriate subsystems or components. Purpose, in this definition of systems study, is as important as function. With this philosophy, we hope to avoid the all-purpose approach to systems qua systems, which proceeds from the assumption that a document-retrieval system is not only like a neural network, for example, or an inter-

urban traffic exchange pattern, but is in fact the same thing. Our library base, in effect, becomes clear.

Thus, in each project listed below, a specific purpose has generated the guidelines for project development. These projects are, in a sense, task-oriented, although this does not preclude generalizable results. The "systems approach" to each has meant the identification and accomplishment of sets of tasks and sub-tasks oriented to a specific goal.

- A. An Operating Test of a Pilot Educational Media Research Information Center. U. S. Office of Education. Title VII Project B-170b. Principal Investigator: A. J. Goldwyn.

(References 1, 2, 3, 4, 29)

Research and development activities related to the establishment of an Educational Media Research Information Center (EMRIC) were concluded in June of 1965.* The CDCR's current research for the USOE is now focused on the preparation of a thesaurus of education terms.** The primary purpose of the thesaurus will be to provide a basic indexing language which can be utilized both for generalized and specialized purposes. One immediate application upon completion will be its incorporation into the coordinate indexing system proposed by the USOE's Educational Research Information Center (ERIC). Beyond this, the standardized indexing language it will provide should improve communications within and between developing education information centers.

The first task in thesaurus preparation has been the identification of significant terms covering all aspects and areas of education. An important

*A final report will be available for distribution in late fall. Results of pilot searching will appear in the fall 1965 issue of AV Communication Review.

**Initiated in February, 1965.

source of such terms has been the Semantic Code Dictionary of Education developed and maintained at the CDCR, which represents the accretion of index terms assigned to articles and reports over the past four years. Terms have been gathered from other sources -- the index to the Encyclopedia of Education Research, titles of Cooperative Research reports, etc., and incorporated into the thesaurus as candidate entries.

Preliminary criteria have been developed for inclusion/exclusion of terms. A core list of some 5,000 terms has been accumulated, which reflects both deletions and additions to the original list as provided by the Semantic Code Dictionary. Candidate terms have been sorted into categories which are analogous to the facets of a faceted classification. The CDCR is incorporating the basic elements of a faceted classification into the thesaurus because it believes such an arrangement offers several advantages not found in more conventional approaches. Among these advantages are:

1. A more usable and more effective display of hierarchical, synonymous and collateral relationships among terms and sets of terms.
2. More consistency in term selection for indexing and searching by providing a more rigidly structured vocabulary.
3. A reduction in the number of RT's (related terms) for each individual entry in the thesaurus, thereby facilitating indexing and searching.

Certain parallels exist between the development of a thesaurus of education terms and the development of thesauri by the Engineers Joint Council (EJC) and the American Petroleum Institute (API). These are being explored with information experts closely associated with the EJC and API. Manager of the various educational research information projects is Gordon C. Barhydt, aided by Charles T. Schmidt. Associated with Gordon C. Barhydt in the preparation of the thesaurus of education-related terms is Alan M. Rees.

- B. Automatic Processing of Metallurgical Abstracts for the Purpose of Information Retrieval. National Science Foundation. Grant No. NSF-GN-303. Principal Investigator: Jessica S. Melton .

(References 15, 16, 17)

Research is continuing on the development and testing of methods for processing previously generated abstracts for information retrieval. The aim of the research, more specifically, is to automate subject indexing, perhaps the most difficult and expensive task of information systems when performed manually.

Briefly the procedure is as follows. Abstracts from the metallurgical section of Chemical Abstracts are punched on Flexowriter tape and converted to magnetic tape, preserving the typographical characteristics of the printed text.

Computer procedures are designed for processing the abstracts on a level above straight dictionary look-up while avoiding total linguistic analysis. Metallurgical terms in the text are located and grouped according to a strict subject indexing rationale. A corpus of 768 abstracts (100,000 words of running text) has been analyzed by the computer techniques developed for this research. These are on magnetic tape in search-ready form.

The project has now reached the testing phase. Real questions submitted to an operational information retrieval service (The American Society for Metals Documentation Service) are being addressed to the automated system. The answers are compared to those which ASM actually sent to their subscribers in response to the questions. Results of these test searches will be used to refine and evaluate the system.

Manager of the project is Celeste Hespen, aided by Dr. M. I. Sastri as Structural Linguist.

- C. Manipulation of Autopsy Diagnoses by Computer Technique. Cooperative Project: CDCR and WRU Institute of Pathology. Project Directors: J. Chandler Smith, M. D., and Jessica S. Melton.

(References 25, 26, 27, 28)

A fully automated information retrieval system for autopsy records, utilizing the original record (punched on paper tape) as computer input, has been developed for the Institute of Pathology of Western Reserve University. Preliminary work leading to this system is partly supported within the framework of the Comparative Systems Laboratory.

The project has generated an unusual amount of interest, particularly after the appearance of the JAMA article (28). The system is currently being tested by the Armed Forces Institute of Pathology (AFIP) which compiles autopsy and surgical data from all Armed Forces Hospitals and all Veterans Administration Hospitals. Approximately 50,000 autopsy reports are received, coded, and filed by the AFIP each year. The National Laboratory of the Atomic Energy Commission at Oak Ridge, Tennessee is also testing the system for possible use in large-scale animal experiments; the Computer Laboratory at the CDCR is assisting in the pilot phase. The potential of the method has been recognized in academic centers; the Universities Associated for Research and Education in Pathology, Inc., has held the first of a series of meetings in Washington to consider applications of the method.

- D. Diabetes Literature Retrieval. Joint project with the University of Minnesota and the University of Rochester under the sponsorship of the National Institute of Arthritis and Metabolic Diseases. Grant No. AM 06399-04. Principal Investigator (for WRU): A. J. Goldwyn.

A portion of the Center's work in cooperation with the American Diabetes Association project, described in previous Newsletters, resulted in the pre-

paration and publication of a title and key-word index of the diabetes-related citations in Index Medicus for 1962. Similar indexes for 1960 and 1961 had been completed previously. Preparation of citations for 1963 is now in process, and it is expected that those for 1964 will follow shortly thereafter.

At an August meeting at the Marine Biological Laboratory, Woods Hole, Massachusetts, plans were completed for the testing of an experimental current awareness service. A thesaurus of diabetes-related terminology has been developed at Minnesota to a preliminary stage. At WRU, many of the computer programs for searching the literature have been written, potential users have been contacted, and work begun on preparation of user profiles. Of particular interest in this connection is the coordination of the Center's selection and manipulation of diabetes-related citations with the accession program and the computer-based bibliographic work of the National Library of Medicine. Alan M. Rees, LaVahn Overmyer and Robert L. Jacobs have collaborated in the direction of this project.

E. Library Mechanization Feasibility Study

LaVahn Overmyer, Asst. Director of the CDCR, has completed a study to determine the feasibility of mechanizing certain routines within the (WRU) University Libraries. Dr. Lyon Richardson, Director of the University Libraries, and Asst. Professor Overmyer have submitted the report to President John S. Millis of Western Reserve in the form of a proposal for a pilot project. It is hoped in this way to provide both a laboratory and a demonstration project, from the point of view of our training program -- while at the same time making a significant contribution to the service value of the library complex.

III. Educational Programs

(References 11, 12, 19, 24)

The documentation and information retrieval curriculum of the School of Library Science of Western Reserve University is closely associated with the research activities of the Center. The merging of an instructional situation with a research environment has contributed to the widening of the students' base of experience and knowledge.

The above makes possible intensive instruction in basic principles; the assignment of problem-solving tasks, designed to give students experience in system operation and development; and the opportunity for participation in the research programs at the Center. It may be of interest to repeat the description of three courses added last year to the "basic" series in documentation and information retrieval. These are Information Retrieval Systems II, Automation of Library Processes and Procedures, and Introduction to Information Retrieval Theory.

Information Retrieval Systems II

Experience is provided with respect to the operation of an information retrieval system. Component parts of a total system are analyzed, such as acquisition, indexing, file arrangement, question analysis, search strategy and evaluation of outputs to illustrate their interaction. Practical experience is given for each sub-system. Each student is required to index a number of documents utilizing several indexing languages. Questions are assigned for analysis and searching, to explore the matching of questions and indexing languages. Students become familiar with the manipulation of a number of storage media (hand-sorted punched cards, magnetic tape, peek-a-boo cards, etc.). Search results are analyzed and tabulated by students and are related to indexing decisions, question analysis and search strategy used. The course, Library Science 574, has been developed and taught by the staff, including Mr. Saracevic, Lecturer in Library Science.

Automation of Library Processes and Procedures

This course is planned to survey and evaluate the possible uses of data processing equipment within the traditional library functions -- administration, acquisitions, catalog production, circulation, intercommunication, etc. Punch cards, computers, micro-records, photography, and visuals are discussed; comparative

costs are considered; current library installations are reviewed. The course, Library Science 572, has been developed and taught by Asst. Professor Overmyer.

Introduction to Information Retrieval Theory.

An elementary treatment of certain mathematical tools needed in the construction of abstract theories and models in the field of information retrieval. Applications of these tools to the design and evaluation of retrieval systems is discussed. The course, Library Science 577, has been developed and taught by Dr. Goffman and Dr. Booth. An earlier version in the form of a lecture series was presented by Robert A. Fairthorne.

Courses: Academic Year 1965-66

- LS. 524 Documentation
- LS. 540 Theory of Classification
- LS. 572 Automation of Library Processes and Procedures
- LS. 573 Information Retrieval Systems I
- LS. 574 Information Retrieval Systems II
- LS. 575 Information Processing on Computers
- LS. 576 Automatic Language Processing
- LS. 577 Introduction to Information Retrieval Theory
- LS. 578 Specialized Information Centers and Services
- LS. 580 Research in Information Retrieval

Special Note. A recent revision of "core" courses required of all those matriculating in the degree programs of the School of Library Science has rendered obsolete earlier printed descriptions of curricula. This change will be of particular interest to those who wish to specialize in the Documentation or Information-Science sequence.

For further information, please address the Director of Admission, Admission Office, Western Reserve University, Cleveland, Ohio 44106, specifically designating the "new" master's or doctoral program.

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